**Chapter 14**

**pg. 255**

Set One

1. light - a wave we don’t necessarily see with our eyes

2. electromagnetic spectrum - the range of waves that includes radio waves, light and X-rays

3. energy level - a property of electrons inside atoms

4. incandescence - heating something up so hot it gives off light

5. fluorescence - stimulating atoms to emit light using light of other energy

Set Two

1. radio waves - electromagnetic waves with very low energy and wavelengths of many meters

2. infrared- electromagnetic waves we feel as heat

3. ultraviolet - electromagnetic waves with more energy than visible light & can cause sunburn

4. Xrays - electromagnetic waves that can pass through the skin and make images of the body

5. gamma rays - electromagnetic waves that have very high energy and come from nuclear reactions.

Set Three

1. polarization - a way of aligning the direction of light wave vibration by blocking some of the waves

2. color - how we perceive different frequencies of light within the visible range

3. photoreceptors - nerves in the eye that are sensitive to light

4. primary colors - red, green, and blue

5. RGB model - making all colors as mixtures of red, green, and blue light

Set Four

1. magenta - a dye that absorbs green light

2. yellow - a dye that absorbs blue light

3. cyan - a dye that absorbs red light

4. photosynthesis - the process plants use to get energy from light

5. CMYK model - making all colors with cyan, magenta, yellow, and black pigments

**Chapter 15**

**pg. 277**

Set One

1. optics - study of how light behaves

2. lens - devise that uses refraction to bend light to form an image

3. mirror - a device that uses reflection to bend light to form an image

4. prism - a device that bends different frequencies of light to separate colors

5. light ray - imaginary arrow used to show the path of a single beam of light

Set Two

1. refraction - bending of light that results as it crosses a boundary between two different substances

2. reflection the bouncing of light rays from a surface

3. telescope - a device that uses a collection of lenses to magnify an image

4. real image - an image formed by rays of light coming together on a surface like the retina of the eye

5. virtual image- an image formed when light rays seem to come from a point other than where the object exists

Set Three

1. normal - line drawn perpendicular to the surface of a mirror or any surface

2. incident ray - ray of light that strikes a mirror

3. reflected ray - ray of light that bounces off a mirror

4. angle of incidence - angle measured from the normal to the incident ray

5. angle of reflection - angle measured between the normal and the reflected ray

Set Four

1. retina - back of the eyeball where the image is formed

2. lens - part of the eye that bends light as it comes into it

3. stereoscopic vision - process by which humans use two eyes to see things with depth

4. total internal reflection- process that happens when light inside a glass of water tries to get out but is reflected back into the material

5. fiber optics - light pipe that uses total internal reflection to carry light and signals from one point to another

**Chapter 14**

**page 256**

1. Photoluminescence means light energy can cause other atoms to emit light.

2. Incandescence happens when heat energy causes electrons to change orbits and give off light.

3. For an atom to emit light, the electrons must move from a high energy level to a lower one.

4. A nuclear reaction produces electromagnetic waves in the gamma ray part of the spectrum.

5. Ovens and cell phones use microwaves.

6. A polarizer is a filter that separates light.

10. Primary colors of light are red, blue, and green.

11. Primary colors of pigments are magenta, cyan, and yellow.

**page 257**

1. From fastest speed to lowest speed: light waves, sound waves, water waves

2. White light is obtained within the three primary colors of light are combined in equal strength.

3. Red and green photoreceptors are stimulated to create the color yellow.

4. To create green paint you must use cyan and yellow

5. A blue cloth absorbs all colors except blue and reflects only blue to our eyes.

6. When light energy is shined on a black object, it is absorbed and turned into heat.

7. Four colors used by color printers are cyan, magenta, yellow, and black.

8. The primary colors used in a color TV monitor are red, green, and blue

9. When a store clerk adds pigments to a can of white paint, more colors are taken away from the light we use to view the paint.

10. The wavelength and frequency of green light are about 580nm and 517tHz. Plants do not absorb much light in this range. Instead they reflect it (giving plants the green color). Because they don’t absorb the light, they can not use it for photosynthesis.

11. The electromagnetic spectrum from LOWEST energy to highest energy is:

radio waves, microwaves, infrared waves, visible light, ultraviolet light, Xrays, and gamma rays

**Chapter 15**

**page 278**

1. Point C

2. An image is best described as a place where light rays leaving one point on an object come together again.

3. Point C

4. Total internal reflection happens when light comes from air and strikes the surface of water.

FALSE –

5. The purpose of the iris is to regulate the amount of light that enters the eye.

6. The purpose of the optic nerve is to send signals from the eye to the brain.

7. Rods and cones change light into a signal that is sent to the brain.

8. The purpose of the lens is to focus light on the back of the eye.

9. Visible light waves are used by grocery store scanners.

10 Visible light waves are transmitted through fiber optics.

11. An alligator must take total internal reflection and refraction into account when hunting.

**Chapter 15**

**Page 279**

1. The term normal may mean average, middle, or perpendicular.

2. The angle of reflection would be 30⁰ if the angle between the incident ray and the reflected ray is 60⁰.

3. The incident angle is measured between the incident ray and the normal.

4. Point B

5. As light goes from air into glass the angle of refraction is less than the angle of incidence.

6. As light goes from glass into air the angle of refraction is greater than the angle of incidence.